

REMARKS

Claims 1-9 are all the claims presently pending in the application. Claims 1-2 have been amended to more particularly define the invention. Claims 3-9 has been added to assure Applicant the degree of protection to which his invention entitles him.

It is noted that the claim amendments herein or later are not made to distinguish the invention over the prior art or narrow the claims or for any statutory requirements of patentability. Further, Applicant specifically states that no amendment to any claim herein or later should be construed as a disclaimer of any interest in or right to an equivalent of any element or feature of the amended claim.

Claims 1-2 stand rejected under 35 U.S.C. §102(b) as being anticipated by Ryuzo (EP 1,203,688). These rejections are respectfully traversed in the following discussion.

I. THE CLAIMED INVENTION

An exemplary aspect of the invention, as recited in claim 1, is directed to a power distribution control apparatus of a four wheel drive vehicle for controlling a power distribution ratio between front and rear wheels. The apparatus has a transfer having at least one vehicle behavior control means for controlling behaviors of the vehicle.

The apparatus includes friction clutch means and power distribution control means for changing the power distribution ratio by varying a torque transmission capacity of the friction clutch means. A torque transmission capacity control means controls the torque transmission capacity based on preestablished tables. The torque transmission capacity control means selects one of the preestablished tables in response to an operation of the vehicle behavior

control means. A torque transmission capacity correct means corrects the torque transmission capacity based on an absolute value of a yaw rate deviation.

Conventionally, when four wheel drive vehicles are mounted with vehicle behavior control apparatuses, such as a vehicle dynamics control system (VDC), traction control system (TCS), or anti-lock braking system (ABS), such systems can interfere with the various controls by the power distribution control apparatuses of the four wheel drive system. (See Application at page 2, lines 4-16)

In order to avoid such interferences, generally, when the vehicle behavior control apparatuses operate, the torque transfer of the power distribution control apparatus is cut off or reduced to a specified minimum value. For example, the four wheel drive may be forcibly changed over to two wheel drive. However, when the torque transfer is cut off or restricted upon operation of the vehicle behavior control apparatuses, the vehicle behavior has an inadequate convergence. (See Application at page 2, lines 17-25 and page 3, lines 1-7)

The claimed invention, on the other hand, provides a power distribution control apparatus of a four wheel drive vehicle having at least one vehicle behavior control means for controlling behaviors of the vehicle including a torque transmission capacity control means for controlling the torque transmission capacity based on preestablished tables, wherein the torque transmission capacity control means select one of the preestablished tables in response to an operation of the vehicle behavior control means and torque transmission capacity correct means for correcting the torque transmission capacity based on an absolute value of a yaw rate deviation. These features, amongst others, enhance the convergence of the vehicle behaviors when the vehicle behavior control apparatus is operative.

II. THE RYUZO REFERENCE

The Examiner alleges that the invention of claims 1-2 are anticipated by Ryuzo. However, Applicant respectfully submits that the reference does not teach or suggest each and every element of the claimed invention.

Ryuzo discloses a power distribution control system for a vehicle, in which a front/rear drive-force distribution control unit computes a torque-response-torque and a yaw-rate feed back torque. (See Ryuzo at page 1, item (57))

However, Ryuzo does not teach or suggest torque transmission capacity control means for controlling the torque transmission capacity based on preestablished tables, wherein the torque transmission capacity control means select one of the preestablished tables in response to an operation of the vehicle behavior control means and torque transmission capacity correct means for correcting the torque transmission capacity based on an absolute value of a yaw rate deviation, as in the claimed invention.

Although Ryuzo appears to be similar in that the transfer clutch torque (T_{tr}) is established separately at the operative time and at the non-operative time in order to avoid the power distribution control interfering with the behavior control of the vehicle behavior control apparatus when the vehicle behavior control apparatus (VDC, TCS) is operative, there is a difference in the calculation of T_{tr} when the vehicle behavior control apparatus is operative.

In the claimed invention, tables establish the T_{tr} according to the transfer input torque (T_i) when the vehicle behavior control apparatus is operative. The tables may be created beforehand by experiments or other means to determine a region of T_{tr} in which interference

with the vehicle behavior control system can be avoided. Thus, it is possible in the present invention to obtain the table to properly increase or decrease Ttr in advance, in order to realize an excellent convergence in vehicle behavior control without causing interference with the vehicle behavior control system.

In this manner, as shown in the table in Figure 4, the Ttr can be established by the tables to avoid interference with the operation of the vehicle behavior control apparatus. Several tables corresponding to the various vehicle behavior control apparatuses can be created and referenced to establish Ttr according to the apparatus in operation. (See Application at page 9, lines 23-25 and page 10, lines 1-24)

A correction of the Ttr based on the absolute value of the yaw rate deviation ($|\Delta\gamma|$) is determined at the time of understeer or oversteer. The yaw rate deviation ($\Delta\gamma$) is determined based on the difference between the target yaw rate (γ') and the actual yaw rate (γ). In this manner, when the vehicle exhibits such a behavior that the absolute value of the yaw rate deviation exceeds a specified value, the Ttr is corrected based on the deviation. (See Application at page 11, lines 6-22)

Thus, in the claimed invention, the Ttr is sought based on predetermined tables correlating Ttr and the transfer input torque (Ti), and Ttr is corrected based on the absolute value of the yaw rate deviation ($|\Delta\gamma|$).

Ryuzo, on the other hand, determines the Ttr based on the following equation:

$$Ttr = Tt + Ttryh \quad (\text{Ryuko at formula (16)})$$

wherein Tt is the torque response torque and Ttryh is a correction quantity based on a predetermined minute torque (ΔT) and a constant (Kus, Kos) selected depending on the

vehicle speed (V) and estimated road surface (μ_e). (See Ryuzo at paragraphs [0049]-[0051] and [0057] and Formulae (12), (13) and (16))

In Ryuzo, T_t is sought based on a power distribution rate (A_i) and a transmission output torque (T_o), which is based on engine torque (T_e), the preset torque ratio of the torque converter (t) and the gear ratio (i). (See Ryuzo at paragraphs [0034] – [0036], Formulae (1) and (2)). However, although this T_t is established at the operative time of traction control and at the operative time of braking power control, respectively, Ryuzo does not disclose or suggest whether T_t is switched and established at the operative time and at the non-operative time, respectively.

In addition, in the claimed invention, the correction is based on the absolute value of the yaw rate deviation ($|\Delta \gamma|$) when correcting T_{tr} at the time of understeer or oversteer, as noted above. Ryuzo, on the other hand, seeks correction based on the vehicle speed (V), the road surface (μ), the estimate value (μ_e), as noted above. (See Ryuzo at paragraphs [0050] – [0051], Formulae (12) and (13)). Indeed, there is no teaching or suggestion in Ryuzo of a torque transmission capacity correct means that corrects the torque transmission capacity based on an absolute value of a yaw rate deviation, as in the claimed invention.

Further, in Ryuzo, the correction is based on estimated values, such as the estimated road surface value (μ_e). In the claimed invention, on the other hand, it is not an estimated value, but rather an actual measured value upon which the correction is made. Indeed, as noted above, the yaw rate deviation ($\Delta \gamma$) upon which the T_{tr} is corrected is calculated from the actual yaw rate. (See Application at page 10, line 25 and page 11, lines 1-5)

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In light of the above, Applicant submits that there are elements of the claimed invention that are not taught or suggested by Ryuzo. Therefore, the Examiner is respectfully requested to withdraw this rejection.

III. FORMAL MATTERS AND CONCLUSION

The Examiner is respectfully requested to consider and make of record the Information Disclosure Statement (IDS) filed on September 16, 2003. Another copy of the previously submitted form PTO-1449 is provided herewith for the Examiner's convenience.

In view of the foregoing, Applicant submits that claims 1-9, all the claims presently pending in the application, are patentably distinct over the prior art of record and are allowable, and that the application is in condition for allowance. Such action would be appreciated.

Should the Examiner find the application to be other than in condition for allowance, the Examiner is requested to contact the undersigned attorney at the local telephone number listed below to discuss any other changes deemed necessary for allowance in a telephonic or personal interview.

To the extent necessary, Applicant petitions for an extension of time under 37 CFR §1.136. The Commissioner is authorized to charge any deficiency in fees, including

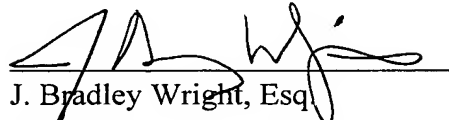
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extension of time fees, or to credit any overpayment in fees to Attorney's Deposit Account

No. 50-0481.

Respectfully Submitted,

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J. Bradley Wright, Esq.
Registration No. 47,188

Sean M. McGinn, Esq.
Registration No. 34,386

McGinn & Gibb, PLLC
8321 Old Courthouse Road, Suite 200
Vienna, VA 22182-3817
(703) 761-4100
Customer No. 21254

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Applicant(s) Tatsunori NAGURA, et al.		
Filing Date Concurrently Herewith	Group Art Unit Not Yet Assigned	

U.S. PATENT DOCUMENTS

EXAMINER INITIAL	REF	DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE

FOREIGN PATENT DOCUMENTS

REF	DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUBCLASS	Translation	
						YES	NO
	61-37541	02/22/1986	Japan			ABS	

OTHER DOCUMENTS (Including Author, Title, Date, Pertinent Pages, Etc.)

EXAMINER

DATE CONSIDERED

EXAMINER: Initial if citation considered, whether or not citation is in conformance with MPEP Section 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.